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Editorial

Thinking Inside and Outside the Box

Robert O. Jacoby, DVM, PhD

Environmental quality and stability are regarded as essential for animal experimentation. This view is reflected in the central and increasingly quantified character of environmental standards that govern and guide the care and use of laboratory animals. These standards have become, as a result, benchmarks for the design, operation and accreditation of animal centers. They have emerged from both documented and empirical sources. The latter, which tend to value anthrocentric preferences, can be controversial during rule-making because of their potential impact on the cost and pace of research. One could argue that there is little reason to assume, a priori, that milieus conducive to human sensibilities, will be equally comforting to laboratory animals. Mice, for example, appear to prefer a decidedly more pungent environment; an observation borne out by the murine demographics of typical farm buildings. This makes ultimate biological sense for a species in which olfaction is vital for physiological and social navigation. Therefore, frequent changes of air and bedding, mandated by anthrocentric standards, are likely to dilute the olfactory smorgasbord on which mice depend for normative function. Nevertheless, and understandably, the demands of contemporary research, and occupational health dictate that the vivarium and the barn cannot and should not be environmentally equivalent.

Modern vivariums are highly sophisticated "boxes", mechanically complex windowless structures that facilitate fine control of air and water quality, photoperiodicity and other environmental parameters. Therefore, they are expensive to build and run. A substantial portion of the cost is devoted to ventilating systems that heat, cool, humidify, filter, and move large quantities of air. Furnaces, fans, chillers, reheating boxes, dampers, humidifiers, filters, controls, and - with increasing prevalence -, individually ventilated cage racks, toil constantly to achieve the narrow tolerances essential for a thermoneutral, microbiologically stable, and comparatively odorless environment. Further, the mechanical designs of many vivariums achieve these tolerances by discarding this exquisitely conditioned air after a single pass, at a rate of about 15 changes per hour. These kinetics translate to 360 changes per day or 131,500 changes per year.

The foregoing musings imply that contemporary vivariums, as energy consumers, are the biomedical equivalents of SUVs. Ironically, this means that environmental standards "inside the box", are likely contributing substantially to environmental stress "outside the box". In other words, the biomedical infrastructure that helps to improve the quality of life for people and animals also may be adding to environmental conditions (i.e. global warming) which could have the opposite effect. If this argument bears weight, it is time to improve current options for vivarial construction with a clear and creative eye toward energy conservation.

Low key efforts at energy conservation have been with us for some time. They include straightforward approaches such as improved insulation, recycling of sanitation water or scrubbing and recirculation of air. More esoteric approaches such as solar, wind or biomass energy also have attracted interest periodically. Complementary technologies include cryopreservation which may reduce the need for animal housing space and energy use. Because it will take energy (and capital investment) to save energy, conservation should be measured in strategic terms rather than by brief cost-benefit analyses. Nevertheless, with vivarial construction (and energy costs) on the rise, there is both immediate need and long term benefit in a national initiative toward energy conservation.

The most important early step is to develop a conservational mind set within laboratory animal science and give it public visibility. Federal sponsorship of a national panel on vivarial energy conservation also would not hurt. Highly experienced laboratory animal scientists, engineers, architects, climatologists and economists could assess current impacts and technologies and develop short and long term conservation strategies. Federal sponsorship could subsequently extend to incentives for creative energy efficient concepts in vivarial construction and renovation. All of this will take time, but we know enough about scientific advances to expect that small conservational victories could accumulate into major improvements. Given recent sobering forecasts about the climatologic fate of the earth, we have a moral as well as a pragmatic obligation to get our conservational act together.

Editor, Comparative Medicine